STUDENTS' CONCEPTIONS AND MISCONCEPTIONS RELATED TO PROBABILITY

Julia Brunner, Joachim Engel, and Laura Martignon, Sebastian Kuntze
Ludwigsburg University of Education
engel@ph-ludwigsburg.de

THEORETICAL BACKGROUND AND RATIONALE OF THE STUDY

While Piaget and Inhelder in their studies claimed that children were not able to deal with probability until they reached the formal operational stage beyond 11 years of age (see, e.g. Jones and Thornton 2005), more recent empirical studies indicate that even young children have valid intuitions about probability. Already in elementary school, children are sensitive to the effects of randomness (e.g. Kuzmak & Gelman 1986). Around the age of 8 most children already know that conjunctive sets cannot be larger than components. At age 11 children show some understanding for the empirical law of large numbers. All these results indicate an increasing and progressive improvement in probabilistic judgment despite research findings that ascertain that children as well as adults overattribute deterministic explanations to situations involving chance.

Fischbein investigated the nature of probabilistic conceptions and intuitions. He claimed that intuitions are adaptable and hence can be influenced by systematic instruction, leading to his important distinction between primary and secondary intuitions. While most of this research was undertaken before any comprehensive introduction of probability into the school curriculum, the reforms in mathematics education of the last two decades emphasize the teaching of probability throughout all grades. Various studies on investigating concepts relating to probability, from elementary school to adult life, focused on two types of probability tasks: random-draw items (e.g. blindly picking objects from a jar) and random distribution tasks (e.g. determining probabilities of flipping several coins). While most studies ascertain that in elementary school the probabilistic judgments are dominated by subjective preferences and choices (Langrall & Mooney 2005) students in the "formal operational phase" (Fischbein) are more apt to adequate responses.

DESIGN, METHOD AND RESULTS

This study is part of the larger RIKO-STAT study (Kuntze, Engel, Martignon, Gundlach in this volume) to investigate the relationships between competencies of solving probability tasks, risk assessment, knowledge about functions, various motivational variables and statistical literacy. The subtest for probability consisted of three random-draw items and three random distribution tasks. Subjects included 549 ninth graders (age 15), 79 fourth graders (age 10) and 360 university students. The data support earlier findings of improving probabilistic judgments with age/ years of schooling. While ninth-graders outperformed fourth-graders, the advantage of the college students over ninth-graders was rather marginal.

CONCLUSIONS

In all groups (elementary school, middle school, university) a number of misconceptions could be identified. With increasing age, however, the magnitude of misconceptions decreased considerably. It will be subject to further analyses within RIKO-STAT to analyze how competencies in probabilistic judgments relate to the competency of reading statistical graphs and tables.

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